CLAIMS

1. A method for simulating by a computer drawing a dent distribution diagram of a surface processed by a shotblasting process, comprising:

a first inputting step for inputting a dent unit area, the number of dents, and an evaluation area to the computer;

a first computing step for computing a dent rate from a theoretical formula $C=100\{1-\exp(-A \cdot N/As)\}$, based on the inputted dent unit area, said inputted number of dents, and the inputted evaluation area, where

C is a dent rate (coverage) (%),

A is a dent unit area (mm^2),

N is the number of dents (piece $\cdot$ mm^2 $\cdot$ sec), and

As is an evaluation area (mm^2);

a first calculating step for calculating, based on the inputted dent unit area, said inputted number of dents, and the inputted evaluation area, a drawing dent unit area, the number of dents to be drawn, and a drawing evaluation area, that are necessary to draw a dent distribution status by a drawing device;

a second calculating step for performing calculations necessary to display in the drawing evaluation area a dent pattern of said number of dents to be drawn, each of said dents having the drawing dent unit area; and

a step for displaying or printing by the drawing device the dent rate and the result of the calculations performed by the second calculating step.

2. A method for simulating by a computer drawing a dent distribution diagram of a surface processed by a shotblasting process, comprising:

a dent rate inputting step for inputting a dent rate to the computer;

a dent existence ratio computing step for computing a dent existence ratio K from a theoretical formula $C=100\{1-\exp(-A \cdot N/As)\}$, based on the inputted dent rate, where

C is a dent rate (coverage) (%),

A is a dent unit area (mm^2),

N is the number of dents (piece · mm^2 · sec),

As is an evaluation areas (mm^2), and

K is a dent existence ratio (A · N/As);

a second inputting step for inputting at least two of a drawing dent unit area, the number of dents to be drawn, and a drawing evaluating area to the computer;

a third calculating step for calculating, based on the computed dent existence ratio and the inputted at least two of the drawing dent unit area, said number of dents to be drawn, and the drawing evaluation area, a drawing dent unit area, the number of dents to be drawn, and a drawing evaluation area, that are necessary to draw a dent distribution status by a drawing device;

a fourth calculating step for performing calculations necessary to display in the drawing evaluation area a dent pattern of said number of dents to be drawn, each of said dents having the drawing dent unit area; and

a step for displaying or printing by the drawing device the dent rate and the results of the calculations performed by the second calculating step.

3. A method for simulating by a computer drawing a dent distribution diagram of a surface processed by a shotblasting process, comprising:

a third inputting step for inputting a shotblast processing condition to the computer;

a dent unit area computing step for computing a dent unit area from empirical formulas $A=\pi D2/4$ and $D=k1 \cdot d \cdot \{1-\exp(k2 \cdot HVa/HVw)\}/\{1-\exp(k3 \cdot V)\}$, based on the inputted shotblast processing condition, where

k1, k2, and k3 are coefficients (having dimensions),

A is a dent unit area (mm^2),

D is the diameter (mm) of a dent,

HVa is the hardness (HV) of the projection material,

d is the size (mm) of the particles of the projection material,

v is a projection speed (m/sec), and

HVw is the hardness (HV) of a product to be processed;

a dent number computing step for computing the number of dents from an empirical formula $N=k4 \cdot M/(\rho \cdot d3/6 \cdot \pi) \cdot (t/60) \cdot As$, based on the inputted shotblast processing condition, where

k4 is a coefficient (having dimensions),

N is the number of dents (piece $\cdot$ mm^2 $\cdot$ sec),

M is a projected amount (kg/min) of the projection material,

t is a processing time (sec),

F is the density (g/cm^3) of the projection material,

As is an evaluation area (mm^2);

a second dent rate computing step for computing a dent rate from a theoretical formula $C=100\{1-\exp(-A \cdot N/As)\}$, based on the computed dent unit area, said number of dents, and an evaluation area arbitrarily set, where

C is a dent rate (%) (coverage),

A is a dent unit area (mm^2),

N is the number of dents (piece $\cdot$ mm^2 $\cdot$ sec),

As is an evaluation area (mm^2);

a fifth calculating step for calculating a drawing dent unit area, the number of dents to be drawn, a drawing evaluating area, that are necessary to display a dent distribution status by a drawing device, based on the computed dent unit area and said computed number of dents, and an evaluation area arbitrarily set;

a sixth calculating step for performing calculations necessary to display in the drawing evaluation area a dent pattern of said number of dents to be drawn, each of said dents having the drawing dent unit area; and

a step for displaying or printing by the drawing device the dent rate and the results of the calculations performed by the sixth step.

4. A system for simulating by a computer drawing a dent distribution diagram of a surface processed by a shotblasting process, comprising:

a first inputting means for inputting a dent unit area, the number of dents, and

an evaluation area;

a first dent rate computing means for computing a dent rate from a theoretical formula $C=100\{1-\exp(-A \cdot N/As)\}$, based on the inputted dent unit area, said inputted number of dents, and the inputted evaluation area;

a first calculating means for calculating a drawing dent unit area, the number of dents to be drawn, and a drawing evaluation area, that are necessary to display a dent distribution status by a drawing device, based on the inputted dent unit area, said inputted number of dents, and the inputted evaluation area;

a second calculating means for performing calculations necessary to display in the drawing evaluation area a dent pattern of said number of dents to be drawn, each of said dents having the drawing dent unit area; and

a first drawing device for displaying or a first printing means for printing the dent rate and the results of the calculations performed by the second calculating means.

5. A system for simulating by a computer drawing a dent distribution diagram of a surface processed by a shotblasting process, comprising:

a dent rate inputting means for inputting a dent rate;

a dent existence ratio computing means for computing a dent existence ratio from a theoretical formula $C=100\{1-\exp(-A \cdot N/As)\}$, based on the inputted dent rate;

a second inputting means for inputting at least two of a drawing dent unit area, the number of dents to be drawn, and a drawing evaluation area;

a third calculating means for calculating a drawing dent unit area, the number of dents to be drawn, and a drawing evaluation area, that are necessary to display a dent distribution status by a drawing device, based on the computed dent existence ratio and said inputted at least two of the drawing dent unit area, said number of dents to be drawn, and the drawing evaluation area;

a fourth calculating means for performing calculations necessary to display in the drawing evaluation area a dent pattern of said number of dents to be drawn, each of said dents having the drawing dent unit area; and

a second drawing device for displaying or a second printing means for printing

the dent rate and the results of the calculations performed by the fourth calculating means.

6. A system for simulating by a computer drawing a dent distribution diagram of a surface processed by a shotblasting process, comprising:

a third inputting means for inputting a shotblast processing condition;

a dent unit area computing means for computing a dent unit area from empirical formulas $A=\pi D2/4$ and $D=k1 \cdot d \cdot \{1-\exp(k2 \cdot HVa/HVw)\}/\{1-\exp(k3 \cdot V)\}$, based on the inputted shotblast processing condition;

a number of dents computing means for computing the number of dents from an empirical formula $N=k4 \cdot M/(\rho \cdot d3/6 \cdot \pi) \cdot (t/60) \cdot As$;

a second dent rate computing means for computing a dent rate from a theoretical equation $C=100\{1-\exp(-A \cdot N/As)\}$, based on the computed dent unit area, said computed number of dents, and an evaluation area arbitrarily set;

a fifth calculating means for calculating a drawing dent unit area, the number of dents to be drawn, and a drawing evaluation area, that are necessary to display a dent distribution status by a drawing device, based on the computed dent unit area, said computed number of dents, and the evaluation area arbitrarily set;

a sixth calculating means for performing calculations necessary to display in the drawing evaluation area a dent pattern of said number of dents, each of said dents having the dent unit area; and

a third drawing device for displaying or a third printing means for printing the dent rate and the results of calculations performed by the sixth calculating means.

7. A method of setting a processing condition in a shotblasting process characterized in that a processing time is computed to attain a target dent rate from the number of dents per given dent unit area during a given period of time.

8. A method for setting a processing condition in a shotblasting process, comprising the steps of:

computing a dent unit area from a given hardness of a projection material, a given size of particles of the projection material, a given speed of the projection material projected, and a given hardness of a product to be processed;

computing the number of dents necessary to attain a given target dent rate; and

computing a processing time from the number of dents, a projection amount, a projection material density, and a projection particle size.

9. A shotblasting device comprising:

inputting means for inputting a target dent rate and a shotblast processing condition;

memory means for storing the shotblast processing condition;

calculating means for calculating a processing time to attain the target dent rate for a surface of a product, based on data called from the memory means;

control means for controlling the shotblasting device to operate for just a period of the processing time calculated by the calculating means; and

projection material accelerating means for accelerating a projection material toward the product surface under the shotblast processing condition.

10. A shotblasting device comprising control means for controlling the shotblasting device to operate for a period of a given processing time for shotblasting a surface of a product; and projection material acceleration means for accelerating a projection material toward the product surface under the shotblast processing condition,

wherein the shotblasting device includes calculating means for calculating the processing time from a target dent rate and the number of dents in a given dent unit area per given period of time under an arbitrary shotblast processing condition so that the target dent rate is attained for the product surface.

11. A shotblasting device that uses the method for setting the processing condition as set forth in claim 7 or claim 8 in the calculating means, comprising:

inputting means for inputting a target dent rate and a shotblast processing condition;

memory means for storing the shotblast processing condition;

calculating means for calculating a processing time based on data called from the memory means so that the target dent rate is attained for a surface of a product;

control means for controlling the shotblasting device to operate for just a period of the processing time calculated by the calculating means; and

projection material acceleration means for accelerating a projection material toward the product surface under the shotblast processing condition.

12. A shotblasting device that uses the method for setting the processing condition as set forth in claim 7 or claim 8 in the calculating means, comprising control means for controlling the shotblasting device to operate to process a surface of a product for just a period of a given processing time; and projection material acceleration means for accelerating a projection material toward the product surface under the shotblast processing condition,

wherein the shotblasting device includes calculating means for calculating the processing time from the number of dents per given period of time in a dent unit area that has been previously obtained for a target dent rate under an arbitrary shotblast processing condition so that the target dent rate is attained for the product surface.

13. A method for setting a processing condition in a shotblasting process, comprising the steps of:

computing a dent unit area from a given hardness of a projection material, a given projection material size, a given speed of the projection material, and a given hardness of a product to be processed;

computing the number of dents necessary to attain a given target dent rate; and

computing a projection amount from the number of dents, a processing time, a density of the projection material, and the projection material size.

14. A method for setting a processing condition in a shotblasting process, comprising the steps of:

computing the number of dents from a given projection amount of a projection material, a given processing time, a given density of the projection material, and a given particle size of the projection material;

computing a target dent unit area to attain a given dent rate; and

computing a speed of the projection material from a dent unit area, a hardness of the projection material, the projection particle size, and a hardness of a product to be processed.

15. A shotblasting device comprising control means for controlling the shotblasting device to perform a shotblasting process on a surface of a product under a shotblast processing condition of a given processing time, a given projection amount of a projection material, or a given speed of the projection material; and projection material accelerating means for accelerating the projection material toward the product surface under the shotblast processing condition,

wherein the shotblasting device includes calculating means for calculating the shotblast processing condition from the number of dents per given period of time in a dent unit area that has been previously obtained for a target dent rate under an arbitrary shotblast processing condition so that the target dent rate is attained for the product surface.

16. The shotblasting device of claim 15, wherein the calculation of the shotblast processing condition in the calculating means is derived from the following relational expressions:

(1) the number of dents = f (a projection amount, a processing time, a density of the projection material, and a particle size of the projection material)

(2) a target dent rate = f (the number of dents and a dent unit area)

(3) a dent unit area = f (a hardness of the projection material, the projection particle size, a speed of the projection material, and a hardness of the product to be

processed).

17. The method for setting the processing condition as set forth in claim 8, 13, or 14, wherein the given amount, processing time, density, projection particle size, hardness, speed of the projection material, the given hardness of the product to be processed, the given number of dents, and the given target dent rate are inputted from a communication terminal located on a communication network, for example, on the Internet, and then calculated by the calculating means, which is located at another place, and wherein the set processing time and the set amount and speed of the projection material are returned to the communication terminal.